Attitudes of Academic-based and Community-based Physicians Regarding EMR Use During Outpatient Encounters

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ABSTRACT

Physician satisfaction with EMR implementations has been reported in a number of recent studies. Most of these have reported on implementation of an EMR in a uniform practice setting rather than comparing satisfaction with implementation between settings. Our objectives in this study were to: *1)* compare and contrast the attitudes of academic-based and community-based primary care physicians toward EMR use 6 months after implementation, and *2)* investigate some of the factors influencing their attitudes toward the EMR implementation. Although physicians in both settings regularly use computers, the academic-based physicians use computers for a wider range of activities. Both groups endorse improvements in quality and communication as well as concern over rapport with the patient and privacy. There is considerable discrepancy between the two settings in ratings of the impact on workflow, with the community-based physicians being much more positive about the EMR. Factors that may account for this discrepancy may include overall expectations of computer systems as well as different rates of adaptation to use of the system.

INTRODUCTION

Implementations of electronic medical record (EMR) systems in outpatient care settings are rapidly increasing. A prominent feature of many of these implementations is physician use of the system for documentation and ordering during the patient encounter. There is now an emerging body of literature that seeks to define factors influencing physician adoption of this technology.[1-7] These studies range from qualitative[7] to quantitative,[1, 5, 6] or utilize a mix of qualitative and quantitative techniques.[2-4] The use of various measures to facilitate "triangulation" of reality has been an explicit factor in some of these reports.[2, 7]

Factors retarding physician acceptance mentioned in the literature include "computer anxiety",[3] increased time compared to previous methods,[4, 6] and concerns over decreased patient rapport while using the computer.[2, 3] Effect of system reliability on user satisfaction has been mixed.[6, 7] After implementation of an EMR, improved access, legibility, organization, and quality of the record contribute to acceptance.[3, 6, 7] Systems that readily incorporate into the physician's workflow are usually rated highly.[4, 6, 7]

Most of these prior studies evaluate the implementation of a single system in a relatively uniform practice setting. A combination of a primary computerized literature search and secondary review of references from the primary search did not find any published information directly comparing an EMR implementation in academic versus community settings. Although opinions are often expressed that academic-based physicians would more readily adopt computers for patient encounters than community-based physicians, there does not appear to be any published data on which these opinions are based.

Our objectives in this study were to: *1)* compare and contrast the attitudes of academic and community primary care physicians toward EMR use 6 months after implementation, and *2)* investigate some of the factors influencing their attitudes toward the EMR implementation.

METHODS

In Spring 1998, we began a comprehensive, longitudinal, multi-method assessment of physician attitudes as part of the evaluation of the pilot implementations of an outpatient EMR in 6 practices of a large academic health system, within the context of financial, quality, and other organizational evaluation metrics. This ongoing evaluation effort seeks to develop validated, re-usable instruments and methods for evaluating these effects and to use them to improve the pilot implementations, as well as the subsequent EMR rollout to all 1700+ physicians in the health system.[2]

The EMR implemented during this study was EpicCare, produced by Epic Systems Corporation of Madison, Wisconsin. Physicians performed all of the functions related to their outpatient practice using system workstations present in the examination

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rooms. Typically, past history documentation, order entry for both medications and diagnostic testing, specifications of level of service and follow-up are all handled directly with the patient present. Documentation specific to the encounter varied by provider, with some providers completing their documentation in front of the patient, and others continuing to use dictation with an interface that imported their visit documentation into the EMR for subsequent correction and electronic signature. The results of the first pilot clinic implementation on both physician and patient attitudes have been reported previously.[2]

This paper covers the post-implementation physician reactions to the EMR at two of the highest-volume sites implemented to date in our health care system. We utilized post-implementation physician surveys, as described below, conducted at six months following implementation. Every effort was taken to maintain subject anonymity in the surveys. Survey data were entered into a database using a double entry method to ensure accuracy. Statistical analysis was performed using the SPSS statistical package.

A validated instrument developed by Cork, et al.[1] (and rooted in the instrument used in the oft-cited Teach and Shortliffe[8] study) was used to assess physicians' general attitudes regarding applications of computers in medicine prior to the EMR implementation, as described previously. Survey items focused on physicians' demand for specific computer system features (the "feature demand" attribute) and the potentially beneficial or detrimental effects of computers on medicine and healthcare in general (the "computer optimism" attribute). Survey items also obtained demographic and computer familiarity data. Additional items were developed for this study to assess physicians' attitudes regarding the potential effects of an EMR on the respondents' medical practice. These items were adapted from the general "computer optimism" items of Cork, et al.[1] and the results of published studies on physicians' attitudes towards EMR use.

The post-implementation survey repeated sections from the pre-implementation survey for comparison. Two additional sections assessed specific EMR functionality and elicited suggested system implementation improvements. The survey was distributed to all primary care physicians within an academic-based general internal medicine (GIM) and a community-based university-affiliated primary care clinic (PCC) following six months use of the EMR.

Factor analysis of the post-implementation survey supported a number of individual scales related to Computer Use, Computer Knowledge, Computer Optimism, Feature Optimism, EMR Satisfaction, and EMR Optimism. The Computer Use scale consisted of items related to using computers for performing various tasks such as communicating, obtaining clinical information, word processing, or searching the medical literature. The Computer Knowledge scale asked respondents if they could define the difference between related computer technical terms. Computer Optimism rated whether the individual felt computers would have a positive or negative impact on medical practice in the future. These first three scales used questions adopted directly from the Cork, et al. study.[1] The Feature Optimism scale rated how specific EMR features impacted patient care. EMR Satisfaction provided an overall indication of how satisfied users were with the EMR implementation. The EMR Optimism scale addressed the impact of the EMR on various aspects of the practice of medicine. From a total of 24 questions on this subject, this was a single factor, 21-item scale that explained 42% of the total variance with reliability of 0.93 (based on a sample size N=60). The last three scales were adapted from the general "computer optimism" items of Cork, et al.[1] and the results of other published studies on physicians' attitudes towards EMR use. The exact questions comprising these scales were drafted and validated for this evaluation process. A full description of the development of the survey, validation, and factor analysis is beyond the scope of this paper, but is in process for peer review.

RESULTS

Response rates for both clinics were very good. In GIM, 21 out of 31 (68%) surveys were returned. For PCC, 13 of 14 (93%) were returned. The two groups were not statistically different with regard to mean age (GIM 37.4 SD 6.92, PCC 38.8 SD 6.78) or gender (GIM 76%, PCC 54% male). Both are large-volume clinics, with GIM providing approximately 35,000 visits per year and PCC providing approximately 67,000 visits per year. A comparison of the top 25 diagnoses at each clinic showed congruity on 12, so the diagnostic mix is similar.

Six months after implementation, both groups reported a similar number of hours of hands-on computer use (GIM 23.8 SD 13.42, PCC 29.3 SD 17.07). However, members of the GIM group tend to use computers for a significantly wider range of activities. In particular, they were much more likely to use computers to communicate with colleagues, write papers, prepare presentations, perform statistical analyses, search the Internet for clinical information, search the medical literature, and complete their teaching responsibilities.

Both groups report universal use of email, although there was a slightly different pattern of use. The GIM group accesses email more frequently. They

also use email to communicate more with academic colleagues. There was no significant difference reported in email communication with clinical colleagues (GIM 71%, PCC 92%) or with patients (GIM 43%, PCC 17%).

There was also nearly universal use of the Internet (GIM 95%, PCC 100%), with no difference between the groups with regard to frequency or type of Internet use.

The GIM group scored significantly higher ($p<0.001$) on the Computer Knowledge scale. There was also a trend toward the GIM group scoring higher ($p=0.08$) on a self-rating of computer sophistication.

In contrast, the PCC group scored significantly higher ($p=0.006$) on the EMR Optimism scale. There was a trend for the PCC group to score higher ($p=0.09$) on the Feature Optimism scale.

There were no differences between the two groups on the Computer Optimism or EMR Satisfaction scales. On individual items of the Computer Optimism scale, both GIM and PCC personnel expect positive effects of computers on cost and quality of care. They also expect enhanced communication with use of computers. The impact on humaneness, as well as personal and professional privacy was expected to be negative. The GIM group felt there would be a negative impact on rapport with the patient, with the PCC physicians rating this as neutral. This difference approached being significant ($p=0.08$). On individual EMR Satisfaction items, both groups indicated that they would not return to the previous system if given the choice. Although the overall scale did not show a difference between the groups, the PCC physicians rated the EMR significantly higher on ease of use ($p=0.03$), and being forgiving of mistakes ($p<0.001$).

Individual items of the EMR Optimism scale showed both striking differences between the groups as well as some consistency in ratings. Overall, the PCC physicians were consistently more positive than GIM. Both groups felt that implementation of the EMR had a positive impact on quality and coordination of care, and communication within the health care team. Both groups also felt the EMR had a negative impact on physician-patient rapport and patient privacy. On most of the remaining items, there was considerable disparity between GIM and PCC. Specifically, the GIM physicians were considerably less positive with regard to impact on interactions with the patient, workflow issues (documentation and orders), and decision support. The Table lists some of the most notable individual items from the EMR Optimism scale, as well as the p-value of comparisons between the two groups on each item.

Effect on:	GIM	PCC	p value
Overall Quality	3.39	4.00	0.04
Interactions	2.61	3.38	0.04
Coordination of care w/ others	3.61	3.77	0.43
Time for documentation	2.39	3.46	0.003
Time to enter orders	1.67	3.00	<0.001
Rapport with patient	2.33	2.92	0.04
Communication w/in team	4.00	3.77	0.43
Availability of record	4.33	4.54	0.41
Accuracy of record	3.39	3.92	0.04
Decision support	3.56	4.54	0.001
Patient privacy	2.50	2.23	0.31
Physician autonomy	2.89	3.00	0.69

Table: Ratings of "Effect of EpicCare in my practice on:" with 1=Highly detrimental and 5=Highly beneficial

DISCUSSION

This study provides an important contribution by directly comparing the implementation of the same EMR in an academic-based to a community-based practice. Although there are considerable similarities in the attitudes of both physician groups, the differences between them are probably most important in determining how an EMR will be adopted in the two environments. As shown by the results related to email and Internet use, all subjects in this study appear to readily adopt computers in other areas of their personal and professional lives. The results also indicate that the academic-based physicians use them for a wider variety of tasks. This reflects the findings of Lacher.[5] Given the variety of tasks expected of academic physicians in addition to patient care, this finding is expected. As a result of this wider use, the academic-based physicians appear to have more knowledge about computers and rate themselves as more sophisticated users.

This increased familiarity with computers does not appear to translate into increased satisfaction with an EMR. Although there are exceptions on individual

items, most items as well as the multi-item scales on this survey were rated significantly higher by the community-based physicians. It is interesting that the tasks that are most labor-intensive, orders and charting,[4] are rated the most negatively by the academic-based physicians. One would expect that the community-based physicians, whose productivity more directly impacts their income, would be more sensitive to this issue. There are two possible explanations of this finding. First, as a consequence of the other tasks performed by academic physicians (teaching and research), they usually spend less total time per week in a clinical setting. Therefore, they would not be as far along the learning curve in the same chronological time span due to decreased overall use. The prolonged learning curve of EMR adoption has been previously reported to impact satisfaction.[4] There may also be different patterns of use between the two groups that are influencing acceptance. As stated in Methods above, there are individual differences in EMR use patterns that have been anecdotally observed between practitioners. We did not investigate whether these differences exist in a systematic manner between the two groups, or whether different usage patterns effected individual acceptance of the EMR. Although the data show a similar overall amount of hands-on computer use, we did not break this down to determine whether there was a difference in amount of EMR use in a typical week.

A second possible explanation for this differential in satisfaction between the GIM and PCC physicians may relate to the increased computer sophistication of the academic physicians. Gamm has reported that once past the initial "computer anxiety" less experienced users appeared to be more satisfied with an EMR.[3] More experienced computer users may be more sensitive to perceived shortcomings of the system from knowing what is possible in other applications. Since the results indicate that the academic-based physicians use computers for a wider variety of tasks in general and appear to have a greater degree of computer sophistication, this may be a factor in their decreased satisfaction.

Given the relatively short time from implementation to assessment in this study, it is not possible to determine if one or both of these mechanisms is contributing to the difference in satisfaction between the two groups. Further longitudinal evaluation, as well as investigation of how usage patterns influence acceptance (through both survey and time-and-motion study methods) to answer this question will be addressed in future work.

There are several findings from this study that reflect similar findings from prior studies. In doing so, this study reinforces the potential to generalize these findings. In effect, this results in additional ability to "triangulate" the true effect of implementation that has been a theme of several investigators.[2, 3, 7] Although there may have been "computer anxiety" in the relatively recent past,[3] most physicians in this study have adopted computers to perform a variety of tasks in a similar manner to that shown in more recent studies.[5, 7] Thus, any reluctance to adopt an EMR at this point in time is probably not a function of resistance to computers in general, but rather of factors that impede their use for this specific function.

The findings that the subjects of this study endorse improved access, communication, quality and legibility as important changes with EMR use has also been reported in prior studies.[3, 7] These benefits of an EMR probably contribute significantly to users' reluctance to return to previous systems once they are past the initial learning curve, also found in this study and previously.[4, 7]

In addition to the relatively short post-implementation follow-up for this study, there are some other limitations that can be mentioned. There are clear, statistically significant differences between the groups on many scales and individual items, which suggests a real effect as a function of practice setting. The existence of spread in the ratings between items and between-group differences in which item is scored higher suggests that the subjects gave their answers careful consideration. However, the overall sample size is small in terms of both numbers of individual subjects, and by only including two practice sites in the study. Repetition of this study over a larger sample and with multiple practice sites would considerably strengthen the findings. The small sample size is also of concern given the number of comparisons that are made between the groups. However, it was felt that reporting the p-values and letting the individual reader interpret the level of significance was the best approach. Finally, the finding that the response rate of the two groups was not statistically different may also be a function of the small sample size. The GIM resident physicians appeared to have a lower response rate than the GIM attending physicians, which contributed substantially to the lower response rate for that clinic.

The single, post-implementation evaluation used for this study limits the ability to determine the effect of prior computer knowledge on subsequent satisfaction. Administrative issues precluded a pre-implementation baseline at the PCC practice studied here. Attention to this issue in subsequent work would be important to confirm whether baseline computer sophistication is a benefit or a liability to future user satisfaction. The initial approach at this institution was to seek more sophisticated computer

users for the first pilot sites to allow early "wins" that would result in positive word-of-mouth for subsequent sites. Although intuitively this would seem correct, in practice an institution may be more successful in the long run to seek sites that are not as developed in their computer expertise.

CONCLUSIONS

This study of an EMR implementation in both an academic-based and community-based practice shows that physicians in both settings endorse improvements in quality and communication as well as concern over rapport with the patient and privacy issues. With regard to impact on workflow, the community-based physicians are much more positive about the EMR. Factors that may account for this inconsistency include differences in overall expectations of computer systems as well as different rates of adaptation to use of the system.

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